

CLAIMS

1. A plasma generation apparatus comprising: an electrode composed of a conductor forming a minute gap which allows a gas generating plasma to pass therethrough and which increases an electron density of a guided microwave, wherein an insulating film is formed on a surface of at least a portion of the electrode, which forms the minute gap.

2. The plasma generation apparatus according to Claim 1, further comprising: a casing composed of a conductor into which the microwave is introduced; and a bottom plate composed of a conductor which performs electromagnetic shielding at an end face of the casing opposite to that at which the microwave is introduced, wherein the minute gap is formed in the bottom plate.

3. The plasma generation apparatus according to Claim 1 or 2, further comprising: a casing composed of a conductor into which the microwave is introduced; and a bottom plate composed of a conductor which performs electromagnetic shielding at an end face of the casing opposite to that at which the microwave is introduced, wherein the bottom plate is provided with a window, and the electrode is disposed at the bottom plate so as to close the window, whereby the minute gap is formed.

4. The plasma generation apparatus according to one of Claims 1 to 3, wherein the electrode has a structure in which the electrode including a portion forming the minute gap is cooled from the inside of the electrode by a cooling medium.

5. A plasma generation apparatus comprising:

- a tubular casing into which a gas and a microwave are introduced;

- a hole provided in a bottom surface of the casing;

- a columnar conductor provided in an axis direction of the casing and having a bottom surface contour inside a contour of the hole;

- a minute gap formed between the contour of the bottom surface of the conductor and the contour of the hole;

- a coaxial waveguide formed by the conductor and the casing; and

- an insulating film formed at least on a contour portion forming the hole which forms the minute gap,

- wherein the microwave is introduced into the minute gap by the coaxial waveguide, and the gas is allowed to pass through the minute gap, whereby the gas is placed in a plasma state at the minute gap.

6. The plasma generation apparatus according to Claim 5, further comprising an insulating film which is formed at least on a portion, which forms the minute gap, of the conductor.

7. The plasma generation apparatus according to one of Claims 1 to 6, wherein the bottom surface of the conductor is cooled from the inside thereof.

8. The plasma generation apparatus according to one of Claims 5 to 7, wherein a hole portion of the bottom surface of the casing is cooled.

9. The plasma generation apparatus according to one of Claims 1 to 8, wherein the microwave is applied in the form of periodic pulses.

10. The plasma generation apparatus according to one of Claims 1 to 9, wherein the plasma is plasma of argon gas or plasma of nitrogen gas.